



# Prevalence of Pathogenic *Aspergillus* species in Atmosphere During Ten Years (2011-2021) in Kathmandu, Nepal



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## Introduction

- Fungal spores in the atmosphere change with meteorological factors, air pollution and probably climate heating.
- *Aspergillus* species, pathogenic and some allergenic fungi, are ubiquitously found in the environment.
- Inhalation of *Aspergillus* conidia lead to invasive disease in immunocompromised individuals.
- *Aspergillus fumigatus* is a major cause of life threatening invasive aspergillosis (IA) that mostly occurs in immunocompromised patients.
- Other infections caused by *Aspergillus* species are chronic pulmonary aspergillosis (CPA), allergic bronchopulmonary aspergillosis (ABPA) and severe asthma with fungal sensitization (SAFS).
- Airborne pathogenic fungi including *Aspergillus* species are prevalent in Kathmandu city and *Aspergillus* diseases have also been reported frequently.
- We described the prevalence of pathogenic *Aspergillus* species in the atmosphere of monument zones during ten years (2011-2021) in Kathmandu, Nepal.

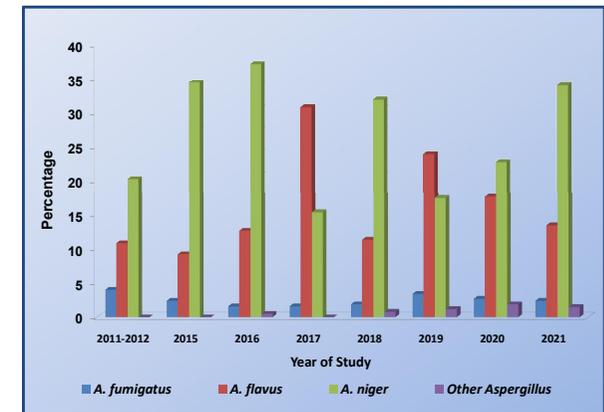
## Materials and Methods

- Airborne fungal conidia were collected using a gravity plate method in monument zones of Kathmandu city between January 2018-October 2021.
- Two sets of duplicate sabouraud dextrose agar (SDA) plates with chloramphenicol (50 mg/L) were exposed in selected locations on seasonal basis and diurnal variations.
- The exposed agar plates were incubated, one at 28°C for total airborne fungal count (nonpathogenic fungi) and another at 37°C for pathogenic airborne fungal count, for up to 3-7 days and examined daily for any visible growth of fungi.

- The different types of fungi including pathogenic *Aspergillus* species were enumerated and identified to species complex level by macroscopic and microscopic characteristics.
- The composition and concentration of pathogenic *Aspergillus* conidia in the atmosphere were compared with the data reported from same locations of Kathmandu between 2011-2017.

## Results

- From the atmosphere, 35,015 fungal colonies and 11,975 pathogenic fungal colonies were isolated during January 2018-October 2021.
- The maximum pathogenic airborne fungal count was recorded in Spring 2021, whereas the minimum pathogenic airborne fungal count was recorded in Winter 2018.
- More than 29 different fungal species complexes belonging to 24 fungal genera were identified.
- Most prevalent airborne pathogenic fungi were the genus *Aspergillus* that accounted for 46.0%, 45.8%, 44.9% and 51.3% in the year 2018, 2019, 2020 and 2021 respectively.
- During the study period, distribution of pathogenic *Aspergillus* species was *A. fumigatus* (2.6%), *A. flavus* (16.0%), *A. niger* (27.8%) and other *Aspergillus* (1.4%).
- The pathogenic *Aspergillus* conidia in the atmosphere reached their peaks in the afternoon.
- The highest and lowest concentrations of pathogenic *Aspergillus* were recovered in Spring and Winter seasons respectively.
- The prevalence of pathogenic *Aspergillus* species was recorded as 35% during 2011-2012, 46% during June-September 2015, 52% in 2016 and 48% in 2017.
- When the pathogenic *Aspergillus* burden in the atmosphere was compared during ten years of the study period, the maximum concentration was recorded in the year 2016.



NB: The species name of genus *Aspergillus* represents "species complex" for that species.

Figure: Prevalence of Pathogenic *Aspergillus* species in atmosphere in Kathmandu, Nepal (2011-2021)

## Conclusions

- The pathogenic and allergenic *Aspergillus* species were prevalent in the atmosphere of Kathmandu city.
- The existence of high concentrations of airborne pathogenic *Aspergillus* conidia pose a greater risk of opportunistic invasive fungal infections and allergenic responses in immunocompromised individuals.
- This study indicates the prevailing situation of aeromycoflora that will be useful in prevention and control of airborne fungal diseases and implementation of measures to reduce environmental pollution.

## Acknowledgements

We thank Atmaz Kumar Shrestha and Prashanna Maharjan for their help during collection of samples.

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